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AUTHOR Kelly, Leonard J.
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ABSTRACT

In response to increased attrition at federal service academies including Department of Defense and Coast Guard Academies, a multidimensional study was conducted of proposed theoretical longitudinal attrition models. The primary goal was to determine if persisters and resignees at the Coast Guard Academy could be differentiated based on a multidimensional measure of social and academic integration and to determine if the effect of such a measure was time-dependent. The study sample consisted of 281 cadets who entered the Coast Guard Academy class of 1991 and remained at the end of the fall freshman term. Measures of academic and social integration included grade-point averages, adaptability for service ratings, officer evaluation scores, conduct ratings, and dates of resignation. Results of the study suggest that cadets' sense of integration may be viewed as evolving over time and that measures of integration have their most profound effects in the immediate subsequent time period, for instance, fall freshman measures provided a practical means to discriminate between persisters and resignees only during the time period immediately following their reporting. The overall conclusion of the study was that the measures of social and academic integration are time-dependent, as the ability to predict group membership utilizing the vector of academic and social integration outcomes wanes with time. Included are 2 figures, 5 tables, and 25 references. (JB)

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RETENTION: THE TIME-DEPENDENT NATURE OF ACADEMIC AND SOCIAL INTEGRATION

LEONARD J. KELLY

ASSOCIATE PROFESSOR
DEPARTMENT OF MATHEMATICS
THE UNITED STATES COAST GUARD ACADEMY
15 MOHEGAN AVENUE
NEW LONDON, CT 06339
(203-444-8256)

MAY 1992

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This paper was presented at the Thirty-Second Annual Forum of the Association for Institutional Research held at the Atlanta Hilton & Towers, Atlanta, Georgia, May 10-13, 1992. This paper was reviewed by the AIR Forum Publications Committee and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC Collection of Forum Papers.

Jean Endo
Chair and Editor
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ABSTRACT

Based on data collected at the United States Coast Guard Academy, this study extends the theoretical construction of the longitudinal attrition models proposed by Spady (1970), Tinto (1975), and Bean (1982,1986) by demonstrating that the effects of academic and social integration are time-dependent. In a departure from studies which rely predominately on self-reported measures of integration, a multidimensional institutionally derived measure of academic and social integration was employed. Using a longitudinal design, the ability to differentiate between persisters and resigneees was found to wane as the integration measure aged.

INTRODUCTION

In 1976, prompted by a rise in attrition at the federal service academies, the General Accounting Office presented a report to the Congress in which it noted that, with the exception of the classes of 1968 and 1974, the Coast Guard Academy, operating within the Department of Transportation, had the highest attrition rate among the federal academies during the 12 year period 1964-1975. Currently, when compared to the Department of Defense academies (Military, Naval, and Air Force), the Coast Guard Academy continues to have the highest rate of attrition. For example, for the class of 1990, the Coast Guard Academy had an attrition rate of 43 percent. For this same class the Military and Naval academies had 26 percent attrition while the Air Force Academy had a 29 percent dropout rate. Moreover, during the past 10 years the Coast Guard Academy averaged 47 percent attrition while the Military Academy averaged 32 percent, the Naval Academy 23 percent, and the Air Force Academy 35 percent. While the average graduation rate of 53 percent in four years at the Coast Guard Academy compares very well with the national rate of 35-40 percent documented by several major studies (Ramist 1981), the rate of attrition at the Coast Guard Academy clearly exceeds that experienced at the Department of Defense academies.

While the attrition rate at the Department of Defense academies declined in response to the 1976 GAO report, the Coast Guard Academy's attrition rate has remained essentially unchanged. However, the cost per graduate at the Coast Guard Academy has risen from $66,200 for the class of 1974 (GAO 1976) to $199,900 for the class of 1990 (Rondeau 1991). Thus, although a discount for inflation must be applied for the purpose of comparison, the education and training of a Coast Guard Academy graduate is an increasingly expensive undertaking. Moreover, by requiring that expenses be reported on a cost per graduate basis, the GAO mandates the inclusion of the cost for each student who departs in the cost of those who remain. As Summerskill (1962) and Bean (1986) pointed out, this concern with costs, by itself, is sufficient to motivate an interest in attrition.

The public cost associated with the education and training of Coast Guard Academy cadets and the fact that the DOD academies have successfully reduced their rates of attrition since 1976 provided the impetus for undertaking a study of attrition at the Coast Guard Academy. As part of this study it was thought that the structured environment of the Academy provided a unique setting in which to test and expand some of the theoretical underpinnings of the attrition process. In particular, an investigation into the time-dependent nature of academic and social integration as they relate to persistence was undertaken.

STATEMENT OF THE PROBLEM

In addition to the GAO report of 1976, three other major studies related to attrition at the Coast Guard Academy have been conducted in the past 30 years: Perry (1961), Rootman (1970), and DeMichiell (1972). All of these studies were exploratory in nature and, with the exception of Rootman's, were non-theoretical attempts to discover differences between those who persisted and those who did not. Each of these studies, including the GAO report, relied primarily on descriptive comparisons and univariate statistical tests. None of the studies explored the critical role of academic and social integration in a multidimensional fashion.

Although each of the studies mentioned above recognized that attrition involves a process of fit between the student and the institution, all of them arrived at this conclusion by frequently analyzing individual factors, mostly student characteristics and self-reported measures, one at a time and in isolation. By relying primarily on univariate comparisons, the studies employed techniques that compared only average overall differences in a particular dimension. The danger in this approach is that the interplay of the various factors involved in the process is ignored: a multidimensional phenomenon is reduced to a number of one dimensional comparisons. This shortcoming plagues many of the attrition studies found in the literature.

Even in the instances in which multivariate techniques were employed, the studies mentioned above investigated the relationship between a single dependent variable and those factors related to it without regard for the reality that an individual's social and academic integration is a multidimensional outcome vector. To analyze single dimensions of this vector in isolation from other dimensions ignores their interaction and the complexities of an individual. In fact, Spady (1970), who is credited with the development of the first theoretical attrition model, used a methodological approach which examined particular dependent variables one at a time. Moreover, none of the studies done at the Coast Guard Academy and few discovered in the literature have analyzed the effects of social and academic integration in a time-dependent sense. The studies reviewed generally relied on two comparative snapshots in time, and no effort was made to determine if the effects of academic and social integration varied in strength during the interval connecting these two points in time.

This study aimed to analyze the process of attrition in a multidimensional sense. The primary goal was to determine if persisters and resignees at the Coast Guard Academy could be differentiated based on a multidimensional measure of social and academic integration and to determine if the effect of such a measure is time-dependent.

BACKGROUND OF THE STUDY

In response to what he perceived to be a lack of theoretical and empirical coherence regarding the attrition process, Spady (1970) conducted an extensive review and synthesis of the literature on student attrition. Based on his review Spady concluded that "the dropout process is best explained by an interdisciplinary approach involving an interaction between the individual student and his particular college environment." Spady viewed this interactive process as the vehicle by which students may become integrated into the academic and social systems of a college.

In particular, drawing on Durkheim's (1951) theory of egoistic suicide, Spady (1970) claimed that the decision to withdraw is based on the extent to which an individual is integrated into the academic and social systems of a college. Relating academic integration to grades and intellectual development and stipulating that social integration is influenced by normative congruence and friendship support allowed Spady to introduce the first theoretical model of student attrition. Spady's model viewed persistence as a longitudinal process which linked family background with an individual's interactive adaptation to the social and academic systems of the college. The explanatory power and causal nature of the model provided an enhancement of theory beyond the descriptive studies that preceded its implementation.

In an empirical attempt to validate his model, Spady (1971) used regression analysis to examine the dependent variables in his model one at a time. Using this technique Spady was unable to capture the interplay among the dependent variables. Likewise, Spady did not investigate the possible time-dependent nature of the influence of academic and social integration. In his empirical study he assumed that "the effects of the independent variables measured during the freshman year continue to have an impact on the attrition process in ensuing years" (Spady 1971). He did not attempt to determine the extent to which academic and social integration measured in the freshman year continued to influence the attrition process right up to graduation.

In an effort to build upon Spady's model and construct a more predictive tool, Tinto (1975) reasoned that Durkheim's treatment of suicide, and hence, Spady's model of attrition, needed to account for individual characteristics and psychological attributes. Tinto (1975) claimed that "one must build into the model sets of individual characteristics and dispositions relevant to educational persistence." Through this claim, Tinto suggested that characteristics beyond family background also act as initial influences in the attrition-retention process. Tinto (1975) postulated that individual background characteristics, attributes, and expectations all have a role in influencing a particular student's academic and social integration. Then, like Spady, Tinto (1975) argued that "it is the individual's integration into the academic and social systems of the college that most directly relates to his continuance in that college."

By connecting academic and social integration with background characteristics, Tinto encouraged predictive studies of student attrition. Additionally, he made other modifications to Spady's model that provided a less cumbersome framework in which to study attrition. For example, although he continued to model academic integration as consisting of two components--grade performance and intellectual development--Tinto (1975) allowed that "persons with high grades are more likely to be high in measures of intellectual development, especially as specified by the notion of congruence with the prevailing intellectual climate of the college." Thus he paved the way for using grade performance itself as a direct measure of academic integration. Likewise, he combined many of the distinct elements that Spady claimed to be influences on social integration and contended that "peer group associations appear to be most directly related to social integration" (Tinto 1975).

Tinto (1975) theorized that background variables and individual characteristics have an initial impact on goal and institutional commitment. In turn, these levels of commitment influence academic and social integration respectively. Finally, as originally suggested by Spady (1970), Tinto (1975) argued that "the process of dropout from college can be viewed as a longitudinal process of interaction between the individual and the academic and social systems of the college."

Embracing the longitudinal process of Spady and Tinto, Pascarella (1980) developed a model stressing the importance of student-faculty interactions. Pascarella suggested that student background characteristics interact with institutional characteristics and influence informal student-faculty contact, other college experiences, and educational outcomes. In turn, the quality of these outcomes influences the persistence-withdrawal decision.

Bean (1982,1986), drawing from studies of turnover in work organizations, developed another model in which background characteristics play an important role in the dropout process. According to Bean, background variables directly impact a student's academic and social integration which, along with organizational variables, interact to produce attitudes that affect institutional fit and commitment. These outcomes, in turn, directly influence persistence. However, Bean also postulated that GPA, itself affected by background characteristics, and environmental pull also directly influence continued enrollment.

Because of the fundamental influence of background characteristics in his model, Bean (1986) suggested that "admitting students who have academic and social characteristics appropriate for an institution may do more to reduce attrition than any postmatriculation program." Thus, an analysis of student background characteristics may help to identify the type of student who is likely to succeed at a given institution.

In sum, the literature on theoretically based causal models suggests that students arrive with certain background characteristics and experiences which interact with the particular

environment in which they find themselves to produce certain levels of academic and social integration. This sense of integration fosters attitudes which affect their continued enrollment.

A great number of studies have found substantial support for the notion that academic and social integration directly influence persistence. Using path analysis, Pascarella and Terenzini (1983) demonstrated that both measures of integration were directly related to persistence. Furthermore, that study and the study by Pascarella and Chapman (1983) found a compensatory relationship between academic and social integration. However, in a follow-up study to replicate the findings of Pascarella and Terenzini (1983), Terenzini, Pascarella, Theophilides, and Lorang (1985) failed to identify a significant and direct path between academic integration and dropping out. Conversely, in an effort to explore the effects of academic advising, Braxton, Duster, and Pascarella (1988) found academic integration to be significantly related to persistence, but social integration failed to link directly with persistence. Munro (1981), using a sample drawn from the National Longitudinal Study of the High School Class of 1972, found a similar result. Stage (1988), on the other hand, found that "academic and social integration positively, directly, and significantly influenced persistence."

On the whole, there is ample evidence to support the notion that, through a longitudinal process, academic and social integration affects the process of attrition. However, empirical tests also show some departures from this model. This seems especially true for the role of social integration as a direct determinant of persistence. Differences found regarding this dimension are most likely the result of difficulties in defining the concept. Widely different techniques and methods of assessment have been used in defining social integration. Without fail, in every study reviewed, social integration was defined through the use of some type of self-reported questionnaire or survey. Not only is there a lack of standardization of the concept, it has, in essence been defined only from the student's perspective. Social integration, it seems, has never been considered from the standpoint of institutional expectations.

In contrast to the various definitions of social integration found in the literature, a Coast Guard Academy cadet's degree of social integration is reflected through compliance with clearly delineated expectations and mores. The extent of a cadet's integration is measured in several ways. Adaptive skills ratings addressing "how the cadet is perceived as a member of the team -- communicating, listening, working effectively with or for others" (Cadet Regulations) are generated each semester. Each cadet is rated by every classmate in his or her company. These ratings provide an assessment of how cadets are perceived by their peers within the highly structured social environment of the Academy. Conduct evaluations are also completed each semester and provide another potential indication of how well an individual has adapted to the social system. Additionally, commissioned officers assigned to oversee each

company of cadets "evaluate the overall contribution of individual cadets to the Academy, their interpersonal skills, their personal qualities, their involvement in the general Academy environment (athletics, clubs, activities, etc.), their compliance with weight management standards, and their support of the rights of others" (Cadet Regulations).

Undoubtedly, there is a complex process of interactions which ultimately define an individual's integration into the social fabric of any organization. However, in the context of the structured Academy environment, it was thought that a multidimensional combination of adaptive skills ratings, conduct ratings, and company officer evaluations comprised an institutionally defined measure of social integration at the Coast Guard Academy.

Regarding academic integration, grade performance, according to Tinto (1975), is "both a reflection of the person's ability and of the institution's preferences for particular styles of academic behavior." Grades, then, represent a coming together of the abilities of the individual and the expectations of the institution. Given the fairly homogeneous academic backgrounds of cadets as measured by high school achievement and entrance examinations, grades were thought to represent a meaningful measure of academic integration at the Academy.

Many studies have validated the general premise of the longitudinal process. While Terenzini and Pascarella (1980), in a review of six studies, found that in none of them could "reliable predictions of attrition status be made solely on the basis of pre-college traits," the influence of student background characteristics through the process of academic and social integration has been confirmed by many studies (Munro 1981, Pascarella and Terenzini 1983, Pascarella and Chapman 1983, Anderson 1987, Stage 1988). These studies suggest that the influence of pre-college characteristics is mediated by an interaction with the institutional environment.

There have been numerous reviews of the literature dealing with variables related to attrition (Iffert 1956, Summerskill 1962, Sexton 1965, Astin 1971, Tinto 1975, Pantages and Creedon 1978, Ramist 1981). The results of the studies cited in these reviews are not wholly consistent but provide a virtually limitless number of factors to consider. Although a separate study has been undertaken to identify those background characteristics most strongly related to attrition at the Academy, the purpose of this report was to investigate the effects of an institutionally defined measure of academic and social integration without regard to those background factors related to it. The primary aim was to examine the effects of measures of integration over time.

RESEARCH QUESTIONS AND HYPOTHESES

To determine if persisters and resignees at the Coast Guard Academy can be differentiated based on a time-dependent multidimensional measure of social and academic integration, the following research questions were analyzed:

1. Based on measures of academic and social integration at the end of the fall freshman semester, to what extent can those who resign prior to graduation be differentiated from those who graduate with their class of entry?

2. Based on measures of academic and social integration at the end of the fall freshman semester, to what extent can those who resign during the spring or summer of the freshman year be differentiated from those who persist beyond that point?

3. Based on measures of academic and social integration at the end of the fall freshman semester, to what extent can those who resign during the sophomore academic year be differentiated from those who persist beyond that point?

4. Based on measures of academic and social integration at the end of the fall freshman semester, to what extent can those who resign after the sophomore academic year be differentiated from those who persist until the graduation of their class of entry?

5. Based on measures of academic and social integration at the end of the spring freshman semester, to what extent can those who resign during the freshman summer or sophomore academic year be differentiated from those who persist beyond that point?

6. Based on measures of academic and social integration at the end of the spring freshman semester, to what extent can those who resign after the sophomore academic year be differentiated from those who persist until the graduation of their class of entry?

The first of these questions is the usual research question investigated by many studies on attrition. In the typical instance, measures of academic and social integration are obtained early on for the particular group of students under study. Then, at some later time, frequently after the graduation of the group, a comparison is made between those who persisted and those who did not. Such an investigation fails to consider, in any fashion, the possible time-dependence of the measures employed.

In the current study two distinct measurement points were employed. The first occurred at the end of the fall freshman term, and a second assessment of integration was conducted at the end of the spring freshman term. Questions two through four are posed in order to permit an investigation of the effects of the fall measures over time. Likewise, questions five and six allow the effects of the measures recorded at the end of the spring freshman term to be assessed over time.

DEFINITION OF TERMS

Certain terms in this study are unique to the Coast Guard Academy and are defined here for the convenience of the reader.

> Adaptability for service rating: A measure of how a cadet is perceived by his or her classmates regarding teamwork, interpersonal communication, and involvement in the group activities of his or her company.
>
> Conduct rating: A measure of the degree to which a cadet complies with the code of regulations which governs expected cadet behavior.
>
> Company officer evaluation: A measure of how a cadet is perceived by his or her company officer regarding overall contribution to the Academy, interpersonal skills, personal qualities, involvement in general Academy activities, compliance with weight management standards, and respect for the rights of others.
>
> Academic and social integration: A four dimensional vector comprised of term grade-point-average, adaptability for service rating, conduct rating, and company officer evaluation, which represents a holistic measure of integration into the academic and social systems of the Academy.

METHODS AND PROCEDURES

SAMPLE

The sample for the study consisted of all cadets entering the Coast Guard Academy class of 1991. This sample of 343 individuals was selected because it provides the most recent information regarding cadet attrition over an entire four year period. For the purposes of this study, the four year period during which the class of 1991 attended the Academy was segmented as follows (yymmdd):

870714-870825	Initial summer
870826-871215	Freshman fall
871216-880520	Freshman spring
880521-880825	Freshman summer
880826-881215	Sophomore fall
881216-890520	Sophomore spring
890521-890825	Sophomore summer
890826-910520	Junior and senior years

This breakdown of time recognizes that the Academy experience is a year-round undertaking in which, even during the summer, cadets are actively involved with their training and educational endeavors.

Because approximately 90 percent of the attrition at the Academy occurs prior to the start of the junior year, there was no need to differentiate between semesters in the junior and senior years. Based on their departure dates, cadets who resigned from the Academy were placed in the appropriate chronological grouping. Because the first measures of integration were not

reported until the end of the fall freshman term, cadets who resigned prior to that time were not included in this study. Thus, the results contained in this report are based on the 281 cadets in the class of 1991 who remained at the Academy at the end of the fall freshman term and received term grade-point-averages, adaptability ratings, conduct ratings, and company officer evaluations. For the purpose of this study a resignee was any cadet who entered with but failed to graduate with the class of 1991.

VARIABLES

The measures of academic and social integration for this study, namely, term grade-point-averages, semester adaptability for service ratings, semester company officer evaluation scores, and semester conduct ratings for each of the fall and spring terms were retrieved from the Cadet Information System. Term grade-point-averages are reported on the typical 4.0 scale. Adaptability for service ratings, company officer evaluations, and conduct ratings are reported on interval scales. Likewise, dates of resignation were retrieved from the Cadet Information System data-base and coded as necessary to facilitate the analysis.

ANALYSIS

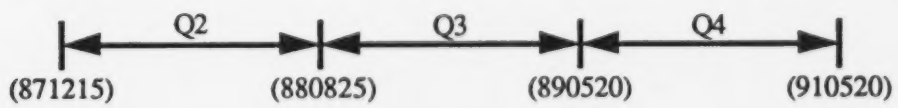
To determine if academic and social integration are time-dependent, a longitudinal study was conducted by segmenting the four year experience of the Academy class of 1991 into discrete time periods. First, an investigation of the effects of the measures of integration reported at the end of the fall freshman term was conducted. This inquiry was facilitated by comparing resignees and persisters for each of the time periods associated with research questions two through four:

Q2: A comparison of those who resigned during the spring or summer freshman terms with those who persisted beyond the summer freshman term.

Q3: A comparison of those who resigned during the fall or spring sophomore terms with those who persisted beyond the spring sophomore semester.

Q4: A comparison of those who resigned after the spring sophomore semester with those who persisted to the graduation date of the class of 1991.

Dividing time in this manner allowed the effects of academic and social integration measured at the end of the fall freshman term to be analyzed in a time series fashion over a continuum as noted by the following time line.

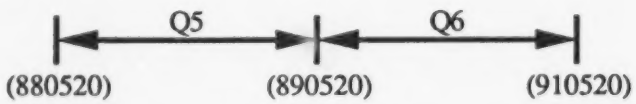


Following the analysis of the effects of the measures of integration reported at the end of the fall freshman term, a similar analysis was conducted using measures of integration reported at the end of the spring freshman semester. This investigation involved the comparison of resignees and persisters for the time periods associated with research questions five and six:

Q5: A comparison of those who resigned during the freshman summer, sophomore fall, or sophomore spring terms with those who persisted beyond the sophomore spring semester.

Q6: A comparison of those who resigned after the spring sophomore semester with those who persisted to the graduation date of the class of 1991.

This allowed the effects of academic and social integration measured at the end of the spring freshman term to be analyzed over the continuum represented by the following time line. This second investigation also provided an opportunity to replicate the findings associated with the fall freshman measures.



As a first step in the analysis, summary statistics were calculated for each of the measures of integration associated with the various comparison groups used in the study. The behavior of these measures over time was assessed through time-series plots and t-tests comparing resignees and persisters. However, recognizing that the analysis of individual measures taken one at a time ignores the natural interaction of the various factors, discriminant function analysis was employed to capture the multidimensional interplay of adaptability for service, conduct ratings, company officer evaluations, and term grade-point-averages. In addition to investigating the extent to which persisters can be differentiated from resignees, discriminant function analysis also revealed the degree to which each component of the academic and social integration vector, in the presence of the others, contributed to the prediction of group membership.

FINDINGS

UNIVARIATE RESULTS

Although 281 cadets in the class of 1991 received adaptability for service ratings, conduct ratings, company officer evaluations, and term grade-point-averages at the end of the fall freshman term, four of those cadets were reverted to the class of 1992 and two others were placed in a special late graduation status. Thus, the analysis associated with research question

one focused on a comparison of the 201 members of the class of 1991 who graduated on time and those 74 who resigned after receiving fall freshman semester academic and social integration scores.

Based on the measures reported at the end of the fall freshman semester, table 1 suggests that there are differences on each of the measures of integration between those who graduated on time and those who resigned. In fact, for each of the measures considered, the p-values

TABLE 1. A Comparison of Graduates and Resignees Using Fall Freshman Measures of Academic and Social Integration

Measure	Resignees (74)	Persisters (201)	p-value
Adaptability for Service	133.73	153.40	.0935
Company Officer Evaluation	96.76	100.82	.0477
Conduct Rating	56.32	68.05	.0001
Term Grade-Point-Average	2.35	2.83	.0001

reported in table 1, which are based on the results of two-tailed t-tests comparing the two groups, indicate that a statistically significant difference may exist between persisters and resignees on each of the dimensions considered. However, as mentioned throughout this paper, such differences are based on two snapshots in time and ignore all that occurred between the end of the fall freshman semester and the graduation of the class of 1991.

In order to study the effects of time, each factor in the four dimensional vector used to define academic and social integration was analyzed by means of time series plots presented in figure 1. In this figure Q2, Q3, and Q4 represent a chronological sequencing of time from the end of the fall freshman term until the graduation of the class of 1991. These points in time correspond to the analyses suggested by research questions two, three, and four, respectively. The time series plots clearly demonstrate that, based on measures of integration reported at the end of the fall freshman semester, there are substantial differences between those who resign in the spring or summer freshman terms and those who persist into the fall sophomore term(Q2). However, the plots also clearly suggest that such differences are diminished over time.

The results of statistical comparisons between resignees and persisters for each of the time periods considered confirms the behavior noted in the time series plots. The results of individual two-tailed t-tests are presented in table 2. Based on these statistical results, it is evident that although differences on each dimension of integration measured at the end of the freshman fall term continued to exist between persisters and resignees, such differences were mollified over time. In fact, although there are statistically significant differences across

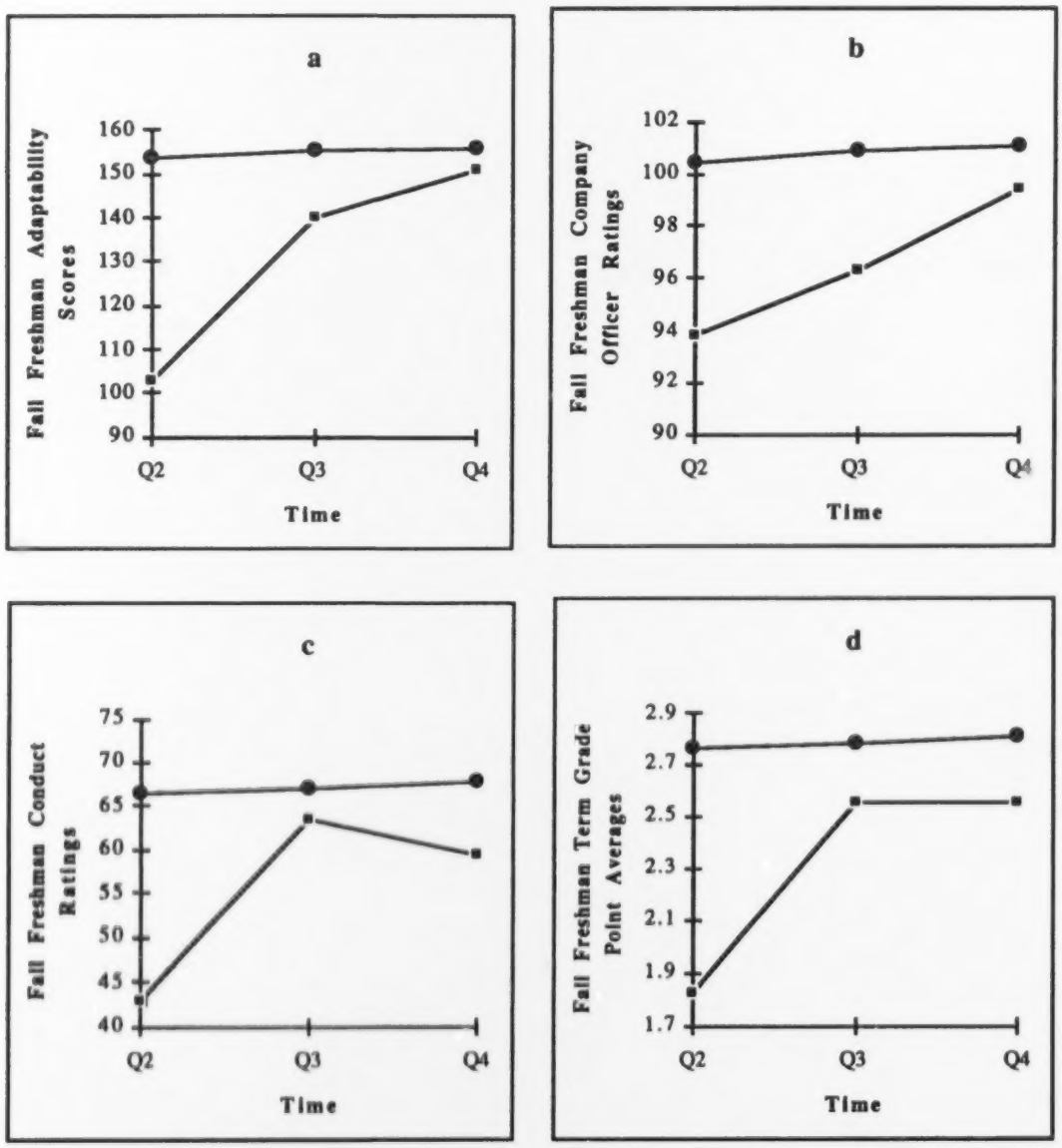


FIG. 1. The behavior of measures of integration reported at the end of the fall freshman term: ● = persisters; ■ = resignees.

all dimensions during the period represented by Q2, the conduct factor is the only dimension that exhibits a statistically significant difference at the $\alpha = .05$ level in the out periods represented by Q3 or Q4.

TABLE 2. A Comparison Over Time of Persisters and Resignees Using Fall Freshman Measures of Academic and Social Integration

Measure	Time	Resignees (n)	Persisters (n)	p-value
Adaptability for Service	Q2	102.7 (20)	153.5 (261)	.0113
	Q3	139.8 (27)	155.1 (234)	.3285
	Q4	150.7 (27)	155.6 (207)	.7773
Company Officer Evaluation	Q2	93.8	100.4	.0570
	Q3	96.3	100.9	.1179
	Q4	99.4	101.0	.5844
Conduct Rating	Q2	42.9	66.6	.0001
	Q3	63.4	66.9	.3928
	Q4	59.3	67.9	.0342
Term Grade-Point-Average	Q2	1.82	2.76	.0001
	Q3	2.55	2.78	.0621
	Q4	2.56	2.81	.0801

MULTIVARIATE RESULTS

Since the factors comprising the vector of academic and social integration naturally occur in a multidimensional sense, a direct stepwise discriminant function analysis was employed in which each of the dimensions of integration were used as predictors of enrollment status. Using the measures of integration recorded at the end of the fall freshman term, a discriminant function analysis was used to determine if those who resigned could be distinguished from those who graduated on time. The results of this analysis are contained in the row labeled GRAD in table 3. Additionally, in an effort to study the effects of time, a different discriminant function analysis was conducted corresponding to each time period represented by Q2, Q3, and Q4. The summary results of these analyses are reported in rows Q2, Q3, and Q4 of table 3.

TABLE 3. Results of Discriminant Function Analyses Using Fall Freshman Measures of Academic and Social Integration

Time	Wilks' λ	Canonical Correlation	% Variance Explained	% Correct Classification Resignees	Persisters
Q2	.83464	.40665	16.6	75.0	83.5
Q3	.97875	.14578	2.1	55.6	63.7
Q4	.96224	.19432	3.7	55.6	69.6
GRAD	.86889	.36210	13.1	62.2	72.1

Although discriminant function analysis produced a statistically significant classification function for differentiating between those who graduated on time and those who resigned, it is clear from table 3 that this difference results only because such a comparison includes those who resigned during the time period represented by Q2. In fact, the results of the discriminant function analyses indicate that the fall freshman measures provide a practical means to discriminate between persisters and resignees only during the time period immediately following their reporting (Q2). Indeed, for the time period represented by Q3 the integration factors used failed to establish a statistically significant classification function. That is, no combination of the integration factors measured at the end of the fall freshman term possessed the ability to statistically discriminate between those who resigned during time period Q3 and those who persisted beyond that point. Likewise, measures of integration reported at the end of the fall freshman term are not of practical use in distinguishing between resignees and persisters during time period Q4. The ability to predict group membership utilizing the vector of academic and social integration outcomes wanes with time.

REPLICATION

In an effort to replicate the findings of time-dependence associated with the measures of academic and social integration reported at the end of the fall freshman term, an investigation using measures reported at the end of the spring freshman semester was conducted. Of the 271 cadets in the class of 1991 who received spring semester scores, four were reverted to the class of 1992 and two were placed in a special late graduation status. As noted in table 4, an analysis of the remaining 265 members who received spring freshman ratings indicates that significant differences may exist between those who graduated on time and those who did not.

TABLE 4. A Comparison of Graduates and Resignees Using Spring Freshman Measures of Academic and Social Integration

Measure	Resignees (64)	Persisters (201)	p-value
Adaptability for Service	133.38	152.29	.1325
Company Officer Evaluation	92.31	101.47	.0038
Conduct Rating	60.68	68.71	.0255
Term Grade-Point-Average	2.24	2.68	.0001

Even though statistically significant differences may exist between those who graduated and those who did not, the time series plots presented in figure 2 demonstrate that with the exception of conduct ratings, differences based on measures of academic and social integration

reported at the end of the spring freshman term are reduced over time. That is, for each measure analyzed, except conduct ratings, there is a larger difference noted between persisters and resignees at time Q5 than there is at time Q6. As with the fall freshman semester scores,

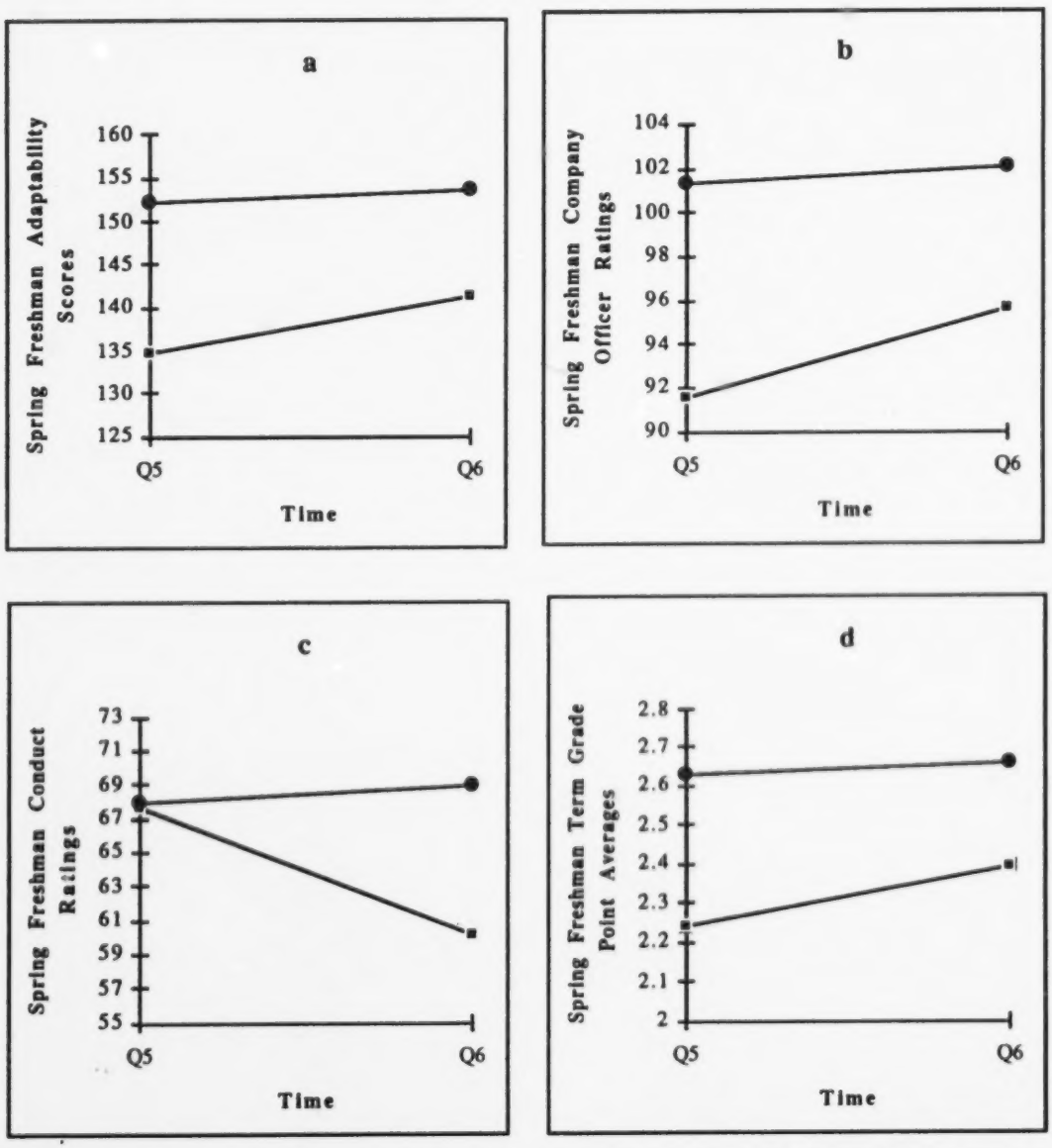


FIG. 2. The behavior of measures of integration reported at the end of the spring freshman term: ● = persisters; ■ = resignees.

the plots of figure 2 confirm that the effects of integration reported at the end of the spring freshman term also have a diminishing impact over time.

The results of individual t-tests comparing persisters and resignees using the spring freshman semester measures are presented in table 5 and confirm the time-dependent behavior illustrated by the plots of figure 2. This analysis presents additional statistical evidence that measures of integration are time-dependent. Although statistically significant differences still exist between the term grade-point-averages of persisters and resignees for the time period represented by Q6, differences for all of the dimensions except conduct ratings are diminished with time.

TABLE 5. A Comparison Over Time of Persisters and Resignees Using Spring Freshman Measures of Academic and Social Integration

Measure	Time	Resignees (n)	Persisters (n)	p-value
Adaptability for Service	Q5	134.8 (32)	152.2 (234)	.2852
	Q6	141.3 (27)	153.6 (207)	.4821
Company Officer Evaluation	Q5	91.6	101.3	.0204
	Q6	95.6	102.1	.1370
Conduct Rating	Q5	67.7	67.9	.9634
	Q6	60.1	68.9	.0781
Term Grade-Point-Average	Q5	2.24	2.63	.0018
	Q6	2.39	2.66	.0271

In an effort to replicate the multivariate results found using the fall freshman semester measures of integration, discriminant function analyses were conducted in which the spring freshman semester measures of integration were used as predictors of enrollment status. First, a discriminant function analysis was used to determine if, on the basis of spring freshman measures, those who resigned could be distinguished from those who graduated on time. The results of this analysis appear in the row labeled GRAD in table 6. To study the effects of time, discriminant function analyses were also conducted in an effort to distinguish resignees from persisters for each of the time periods represented by Q5 and Q6. The results of these analyses are also contained in table 6.

None of the classification functions derived from the discriminant function analyses using spring freshman semester measures of integration provide particularly useful results. Although the results for time periods Q5 and Q6 indicate a diminished capacity to explain the variance in enrollment status, the evidence of time-dependence is not nearly as convincing as that provided by the fall freshman measures. A possible explanation for this lies in the fact that in order

TABLE 6. Results of Discriminant Function Analyses Using Spring Freshman Measures of Academic and Social Integration

Time	Wilk's λ	Canonical Correlation	% Variance Explained	% Correct Classification Resignees	Persisters
Q5	.95011	.22336	4.9	59.4	61.1
Q6	.96188	.19525	3.8	63.0	60.9
GRAD	.91927	.28413	8.1	60.9	62.2

to ensure an adequate sample size, the duration of time period Q5 was extended to include the freshman summer and the entire sophomore academic year. Thus, for the period of time represented by Q5 the effects of the measures of integration received at the end of the spring freshman term may have been confounded by the measures received at the end of the fall sophomore term. Those who resigned during the time period represented by Q5 may have done so in response to either spring freshman term measures or fall sophomore semester measures. Regrettably, because of sample size considerations, the analyses did not isolate the effects of the measures reported at the end of the spring freshman term.

CONCLUSION AND DISCUSSION

In contrast to the other three dimensions, conduct ratings exhibit some departures from the expectation of time-dependent behavior. This is especially true in the analysis of the spring freshman term conduct ratings reported in figure 2(c). A reasonable explanation for the haphazard behavior of conduct ratings emerged from interviews with cadets. Many freshmen, or fourth class cadets, reported that conduct ratings are strictly a matter of chance: being in the wrong place at the wrong time. As the underclass, fourth class cadets may be placed on report and given demerits by anyone senior -- and everyone is. Demerits, many cadets believe, should not be taken personally. Because of this impersonal attitude toward them, conduct ratings, especially for fourth class cadets, may not represent a significant measure of social integration.

Although conduct ratings do not exhibit behaviors totally consistent with the thesis, the overall results of this study seem to confirm the claim that measures of academic and social integration are time-dependent. Whether viewed one at a time or as a multidimensional outcome vector, the effects of adaptability for service, company officer evaluations, and term grade-point-averages, as they relate to enrollment status, were found to wane with time. This finding is critical in the interpretation of studies that seek to differentiate between persisters and

resignees. To assume that measures of academic and social integration, reported early on, continue to exert the same influence over time is to ignore the possibility that other things, including a revised sense of one's integration, may intervene.

Based on the results of this study, it seems that one's sense of integration may be viewed as evolving over time. The implication of this study is that measures of integration have their most profound effects in the immediate subsequent time period. If this is the case, the need for timely and ongoing assessments of such measures is an important element in any program designed as an intervention in the attrition process.

Because the measures of academic and social integration used in this study are based on multiple inputs, these measures would seem to be more reliable than the self-report measures found in other studies reviewed. In testing the longitudinal model of attrition, this is considered to be a major advantage. However, other than at the other service academies, it is doubtful that many colleges are able to require such inputs. Nonetheless, the measures indentified in this study as adaptability for service ratings and company officer evaluations have their counterparts at most institutions. Although they may be derived through less formal means, measures which capture the extent to which one fits into the environmental fabric are obtainable at most institutions. Although other specific measures may be relevant at other institutions, the overriding conclusion of this study is that such measures should be viewed as time-dependent.

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